CLAIMS

We claim:

1. A device for altering a trajectory of a droplet comprising:

a throated structure having a nozzle defined therethrough with an entrance port at a proximal end of the nozzle and an exit port at a distal end of the nozzle; and

wherein the throated structure further defines at least one channel in fluid communication with the nozzle for receiving a flow of fluid such that the trajectory of a droplet entering the entrance port is alterable by the flow of fluid to a predetermined path as the droplet passes through the exit port.

2. The device of claim 1 wherein the fluid comprises a gas.

3. The device of claim 2 wherein the gas comprises air.

4. The device of claim 1 wherein the fluid comprises a mist stream.

5. The device of claim 4 wherein the mist stream comprises micro-droplets having a size 100 times smaller than a size of the droplet.

6. The device of claim 1 wherein the fluid is drawn through the channel by a vacuum.

7. The device of claim 1 further comprising a vacuum pump adapted to be in fluid communication with the structure.

8. The device of claim 1 wherein the fluid enters the throated structure through the entrance port.

9. The device of claim 1 wherein the fluid exits through the exit port.

10. The device of claim 1 wherein the fluid enters the throated structure through a channel defined distally of the proximal end.

11. The device of claim 1 wherein the fluid exits through the channel.

12. The device of claim 11 wherein the channel extends perpendicularly from a longitudinal axis defined by the nozzle.

13. The device of claim 11 wherein the channel extends from the exit port of the nozzle.

14. The device of claim 13 wherein the channel is defined at least partially by a wall having a cross-sectional profile which partially follows an elliptical shape wherein a major axis of the elliptical shape is perpendicular to a centerline defined by the nozzle.

15. The device of claim 1 wherein the nozzle converges from the entrance port to the exit port.

16. The device of claim 15 wherein the nozzle has a conical shape.

17. The device of claim 15 wherein the nozzle is surrounded by a wall having a curved shape.

18. The device of claim 15 wherein the nozzle is defined by a wall having a cross-sectional profile which partially follows an elliptical shape from the entrance port to the exit port wherein a major axis of the elliptical shape is parallel to a centerline defined by the nozzle.

19. The device of claim 1 wherein the entrance port has a diameter of 1.0-3.0 mm.

20. The device of claim 1 wherein the exit port has a diameter of 0.025-1 mm.

21. The device of claim 1 wherein the distal end of the structure is cylindrically uniform in shape.

22. The device of claim 21 wherein the cylindrically uniform distal end of the structure is 0.5-1 mm in length.

23. The device of claim 1 wherein the throated structure is 1-150 mm in length.

24. The device of claim 1 wherein the flow of fluid has a flow rate of about 0.5-5 liters per minute.

25. The device of claim 1 wherein the trajectory of the droplet comprises a first trajectory prior to entering the entrance port and a second trajectory after passing through the exit port.

26. The device of claim 25 wherein the first trajectory of the droplet defines an angle of 0°-22.5° from a longitudinal axis defined by the throated structure.

27. The device of claim 26 wherein the first trajectory of the droplet defines an angle of 0°-15° from the longitudinal axis defined by the throated structure.

28. The device of claim 25 wherein the second trajectory of the droplet defines an angle of 0° from a longitudinal axis defined by the throated structure.

29. The device of claim 1 wherein the throated structure is attached to a movable platform configured to translate the throated structure in a planar direction relative to a wellplate disposed adjacently to the proximal end of the nozzle.

30. The device of claim 29 wherein the movable platform is configured to translate the throated structure in a planar direction over a distance of at least 2 mm.

31. The device of claim 29 wherein the movable platform is further configured to rotate the throated structure about a point centrally defined within the throated structure such that the proximal end of the nozzle is angularly disposable relative to the wellplate.

32. A system for altering a trajectory of a droplet comprising:

a throated structure having a nozzle defined therethrough with an entrance port at a proximal end of the nozzle and an exit port at a distal end of the nozzle, wherein the throated structure further defines at least one channel in fluid communication with the nozzle for receiving a flow of fluid such that the trajectory of a droplet entering the entrance port is alterable by the flow of fluid to a predetermined path as the droplet passes through the exit port; and

a droplet generator for forming the droplet, the droplet generator being disposed proximally of the throated structure.

33. The system of claim 32 further comprising a target medium disposed distally of the exit port and positioned to receive the droplet.

34. The system of claim 33 wherein the target medium comprises a planar medium which is perpendicular to a longitudinal axis defined by the throated structure.

35. The system of claim 33 wherein the target medium comprises a glass slide.

36. The system of claim 32 further comprising a capillary tube adapted to be inserted into a reservoir of liquid from which the droplet is ejected.

37. The system of claim 32 further comprising a wellplate disposable between the proximal end of the throated structure and the droplet generator, wherein the wellplate comprises at least one well from which the droplet is ejected by the droplet generator.

38. The system of claim 37 wherein the wellplate comprises a microtiter plate having 24, 96, 384, 1536, 3456, or 6912 wells.

39. The system of claim 37 wherein a distance from the wellplate to the proximal end of the throated structure is 0.25-8 mm.

40. The system of claim 32 further comprising a manifold adapted to receive the throated structure such that the manifold defines at least one channel in fluid communication with the exit port, the manifold further defining an orifice through which the droplet traverses.

41. The system of claim 32 further comprising a pump in fluid communication with the throated structure.

42. The system of claim 32 further comprising an electrically chargeable member located in apposition to the exit port for polarizing the droplet such that the trajectory is further altered.

43. The system of claim 42 wherein the electrically chargeable member comprises a pin.

44. The system of claim 42 wherein the electrically chargeable member is adapted to be in electrical communication with a voltage source.

45. The system of claim 44 wherein the voltage source produces between 500-40,000 volts.

46. The system of claim 45 wherein the voltage source produces 7500 volts.

47. A device for altering a trajectory of a droplet comprising:

a plate having a first surface and a second surface, wherein the plate defines a plurality of throated nozzles therein, each nozzle having an entrance port defined in the first surface and an exit port defined in the second surface; and

at least one channel defined within the device for receiving a flow of fluid therethrough, the channel being in fluid communication with and common to each nozzle such that the trajectory of a droplet entering the entrance port of any nozzle is alterable by the flow of fluid to a predetermined path as the droplet passes through the exit port.

48. The device of claim 47 wherein the channel through which the fluid flows is defined between a well mask and the first surface, the well mask defining a plurality of orifices each located adjacent to a corresponding entrance port in the first surface.

49. The device of claim 47 wherein the plate further defines at least one inlet in fluid communication with the channel.

50. The device of claim 47 wherein each of the throated nozzles defines a centerline which is perpendicular to the first surface.

51. The device of claim 47 wherein each of the nozzles converges from the entrance port to the exit port.

52. The device of claim 47 wherein each of the nozzles is defined by a wall having a cross-section profile which partially follows an elliptical shape from the entrance port to the exit port wherein a major axis of the elliptical shape is parallel to a centerline defined by the nozzle.

53. The device of claim 47 wherein the plate is configured for placement over a wellplate having a plurality of wells such that the entrance port of each nozzle is located over a well.

54. The device of claim 53 wherein the wellplate comprises a microtiter plate having 24, 96, 384, 1536 3456, or 6912 wells.

55. The device of claim 47 further comprising a manifold located adjacent the second surface, the manifold defining a receiving channel therein for receiving the flow of fluid, the manifold further defining an orifice through which the droplet traverses.

56. The device of claim 55 wherein the receiving channel is perpendicularly positioned relative to a centerline defined by the orifice.

57. The device of claim 48 wherein each orifice has a preconfigured diameter adapted to prevent the fluid from passing turbulently therethrough.

58. The device of claim 48 wherein each orifice is defined through a capillary tube extending from a surface of the well mask, each of the capillary tubes being adapted for insertion into a reservoir of liquid from which the droplet is ejected.

59. A method of altering a trajectory of a droplet comprising:

flowing a fluid at least partially through a throated structure having a nozzle defined therethrough with an entrance port at a proximal end of the nozzle and an exit port at a distal end of the nozzle;

passing the droplet having a first trajectory into the entrance port;

altering the first trajectory of the droplet to a predetermined second trajectory via the flowing fluid; and

passing the droplet having the second trajectory through the exit port.

60. The method of claim 59 further comprising altering the second trajectory of the droplet to a predetermined third trajectory via an electrically charged member positioned distally of the exit port.

61. The method of claim 59 further comprising stabilizing a surface of a liquid reservoir from which the droplet is ejected via a capillary tube prior to passing the droplet having the first trajectory into the entrance port of the nozzle.

62. The method of claim 59 wherein flowing the fluid through the throated structure comprises urging the fluid flow via a vacuum pump adapted to be in fluid communication with the throated structure.

63. The method of claim 59 wherein the first trajectory of the droplet defines an angle of 0°-22.5° from a longitudinal axis defined by the throated structure.

64. The method of claim 63 wherein the first trajectory of the droplet defines an angle of 0°-15° from the longitudinal axis defined by the throated structure.

65. The method of claim 59 wherein the second trajectory of the droplet defines an angle of 0° from a longitudinal axis defined by the throated structure.